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An Economic Evaluation of the Oak Creek Range Management Area, Utah

C. Arden Pope III
Fred J. Wagstaff

THE AUTHORS

C. ARDEN POPE III is an associate professor of agricultural and resource economics at Brigham Young University. He received his Ph.D. degree in agricultural economics from Iowa State University in 1981. Previously, he worked as a research associate and staff economist for the Center for Agricultural and Rural Development and as an assistant professor of agricultural economics at Texas A. & M. University. He has conducted and published research findings dealing with a broad range of issues and topics relating to production and natural resource economics.

FRED J. WAGSTAFF is a range economist with Intermountain Research Station, Shrub Sciences Laboratory, Provo, UT. He received his Ph.D. degree in range and wildlife science from Brigham Young University in 1983. He has served in the Forest Service in various planning and administrative capacities for approximately 20 years. He has conducted research primarily relating to range and resource economics.

RESEARCH SUMMARY

The Oak Creek Range Management Area was established in 1978 under the Intermountain Region's Range Validation Program to provide information about the overall cost effectiveness of range improvement practices within pinyon-juniper ecosystems. The project continued through 1985. Despite disruptions caused by two large wildfires, tens of thousands of acres of revegetation work was completed, several water development projects were completed, and many miles of fences were built. Forage available to livestock was increased, and the need for reductions in grazing on some allotments was eliminated. Project leaders and participants demonstrated a high level of commitment, competence, and cooperation. The project has considerable value as a demonstration area.

However, the project was not economically feasible. Given the high costs of implementing and managing the project and the relatively low value of the increased forage production, the costs of the project far exceeded its benefits to livestock production. Attempts to account for nonmarket benefits and refine cost and benefit estimates have limited impact on the overall lack of cost-effectiveness.

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INTRODUCTION

From 1970 to 1972, the Forest Service conducted a nationwide Forest-Range Environmental Study of current and potential rangeland productivity. Based on this study, in late 1973 the Forest Service decided to implement an accelerated range management program that included several "validation areas" for various ecosystems. The Oak Creek Management Area was established under this program in 1978 to provide information about the overall effectiveness of range improvement practices within pinyon-juniper ecosystems. The project emphasized the necessity of and benefits from coordinated planning and action between Federal, State, and local agencies, as well as private landowners. Despite disruptions caused by two large wildfires, including the much publicized "Oak City Fire," tens of thousands of acres of revegetation work was completed, several water development projects were completed, many miles of fences were built, and over 50,000 acres of fire rehabilitation effort was completed. In 1985, coordinators of the project were awarded the Secretary of Agriculture's Distinguished Service Award for the most notable conservation action in the Nation.

The general project plan of the Oak Creek Mountain Range Evaluation Area stated that "a basic premise for all the development work is that of cost-effectiveness where marketable and nonmarketable range outputs and costs are evaluated" (U.S. Department of Agriculture, undated). Project managers often interpret the term "cost-effectiveness" to mean the least-cost method of applying various treatments. They seldom equate it with economic efficiency in the traditional manner of economists. Using the Oak Creek management project as a significant and unique case study, this paper evaluates the economic impacts of range improvement practices in the pinyon-juniper ecosystem. Although the participation of the private landowners and ranchers was vital to any success of the project, the basic focus of this analysis is on the economic efficiency and benefits and costs of range improvement practices on the pinyon-juniper vegetative zone that, in the project area, is confined almost entirely to National Forest and Bureau of Land Management (BLM).

This paper first describes the project area and gives a brief review of the project. Next is a discussion of the applicability of benefit-cost analysis to evaluate range improvement projects on public land. This is followed by the general results of the benefit-cost analysis and the nonmarket benefits of the project. And finally, the basic conclusions of the analysis.

Popular names of plants and animals are used in the text. The appendix contains a list of both popular and scientific names.

PROJECT AREA

The Oak Creek Management Area encompasses approximately 316,600 acres. It is about 15 miles north of Fillmore, UT, in Millard and Juab Counties (see figs. 1 and 2). It includes 117,200 acres managed by the Forest Service, 109,800 acres of private land, 59,800 acres of BLM land, and 29,700 acres of State land (see fig. 2).

Approximately 80 ranchers own land or run cattle within the project area. Most have less than 50 head of cattle that they graze on public lands. Within and surrounding the area are relatively small farming and ranching communities. The nearest major metropolitan areas are Provo/Orem and Salt Lake City, approximately 100 to 150 miles to the north. In spite of being relatively remote, the Oak Creek Area receives over 10,000 user-days of sport hunting and fishing.

Topography is highly variable, ranging from desert-shrub flats at the 4,700-foot elevation through rolling foothills and benches to steep rocky peaks that exceed 9,700 feet. The climate is characterized by cold winters and mild summers. Average annual precipitation ranges from approximately 7 inches at the lower elevations to over 20 inches at the higher elevations. There is significant year-to-year variability in precipitation.

Five major native vegetation zones are within the project area (see fig. 3). **Aspen-conifer**—with Douglas-fir, white fir, subalpine fir, quaking aspen, and Engelmann spruce as the major plant species—is found in the highest elevations. At somewhat lower elevations is **mountain brush** with Gambel oak, big tooth maple, antelope bitterbrush, common chokecherry, alderleaf, slender wheatgrass, smooth brome, bluebells, and geraniums as the major plant species. In the lower foothills and benches, the predominant vegetative zone is **pinyon-juniper** with Utah juniper and pinyon as major plant species, as well as species similar to those found in the sagebrush-grass zone.

The vegetative zones found on the lower flat lands are **sagebrush-grass** with big sagebrush, antelope bitterbrush, serviceberry, cliffrose, deerbrush, wheatgrass, needle-and-thread, and Sandberg bluegrass as major plant species; and **desert shrub** with greasewood, shadscale, horsebrush, fourwing saltbush, winterfat, squirreltail, sand dropseed, and saltgrass as the major plant species. Much of the rolling bottomland and flat alluvial plains that spread out

below the foothills is used as farmland, both dry land and irrigated land.

A wide variety of wildlife species can be found in the area. They include mule deer, jackrabbits, coyotes, bobcats, mourning doves, chukar, red-tailed hawks, and blue grouse. Surface water within the project area is limited.

Oak Creek is the only perennial stream. Fool Creek, Duggins Creek, and Eightmile Creek run for only part of the year. Fish are found only in Oak Creek. Stream conditions are relatively poor for fish production due to highly variable stream flow. Rainbow trout are stocked in the stream during the fishing season by the Utah Division of Wildlife Resources.

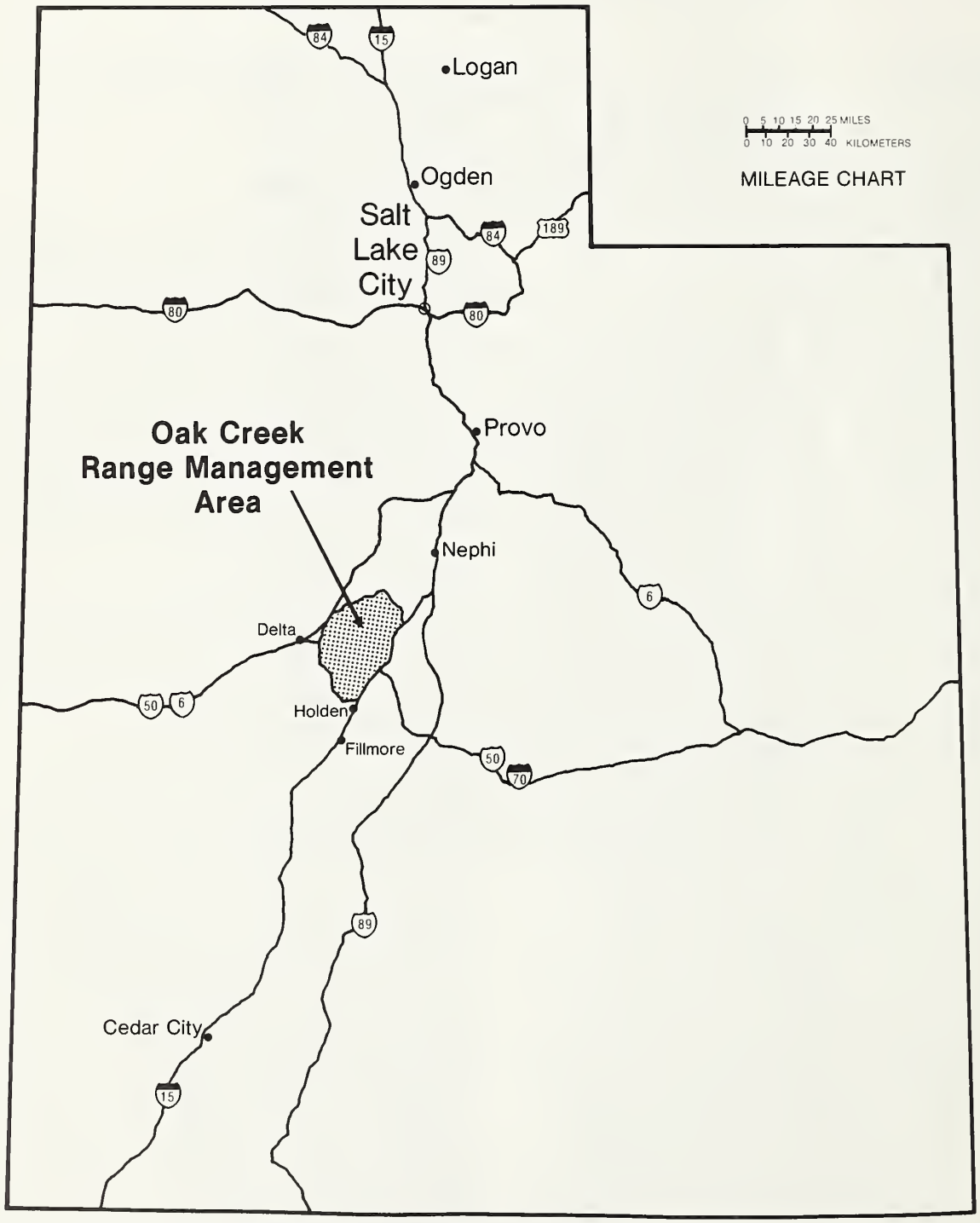

Figure 1—General location of Oak Creek Range Management Area.

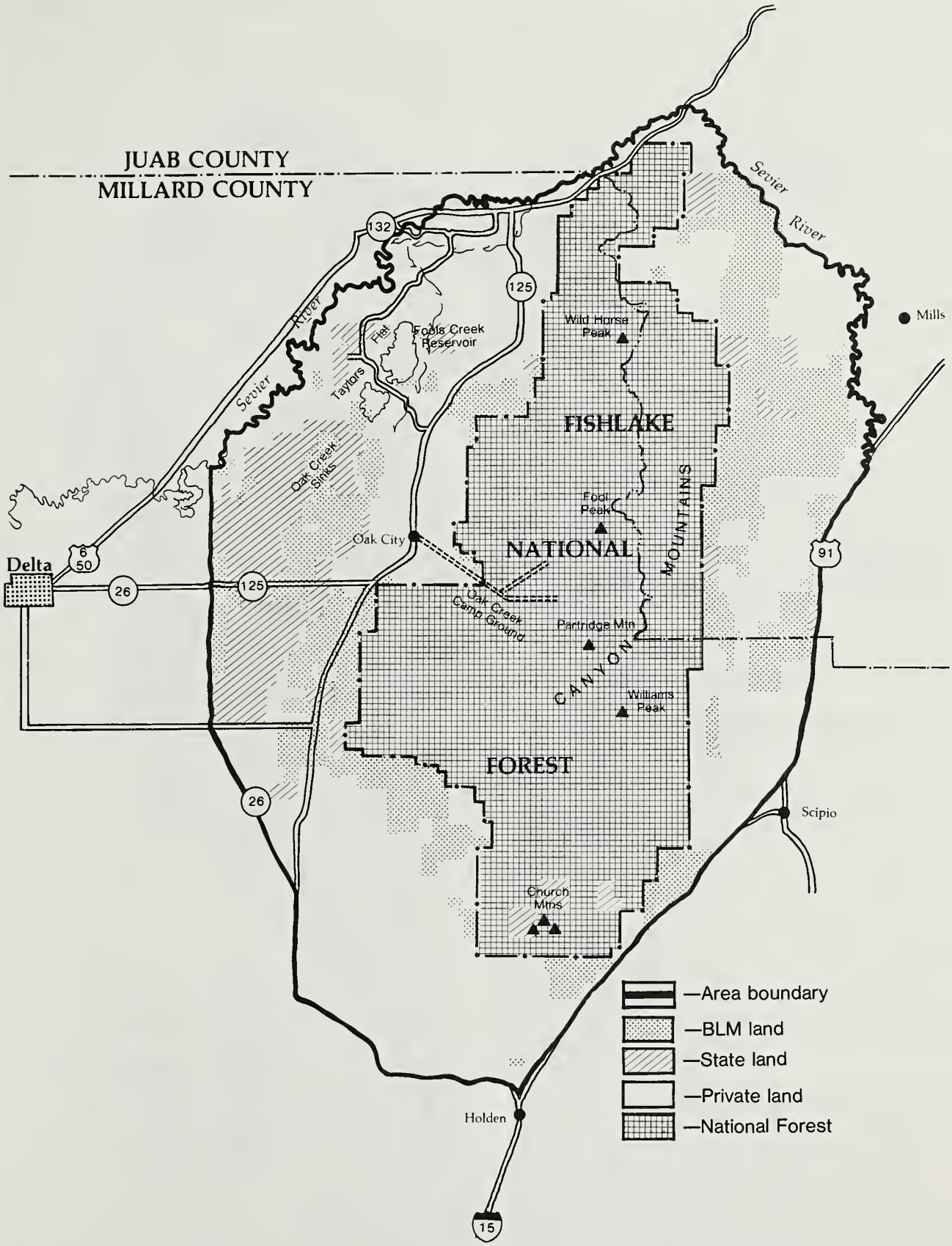

Figure 2—Jurisdictional areas.

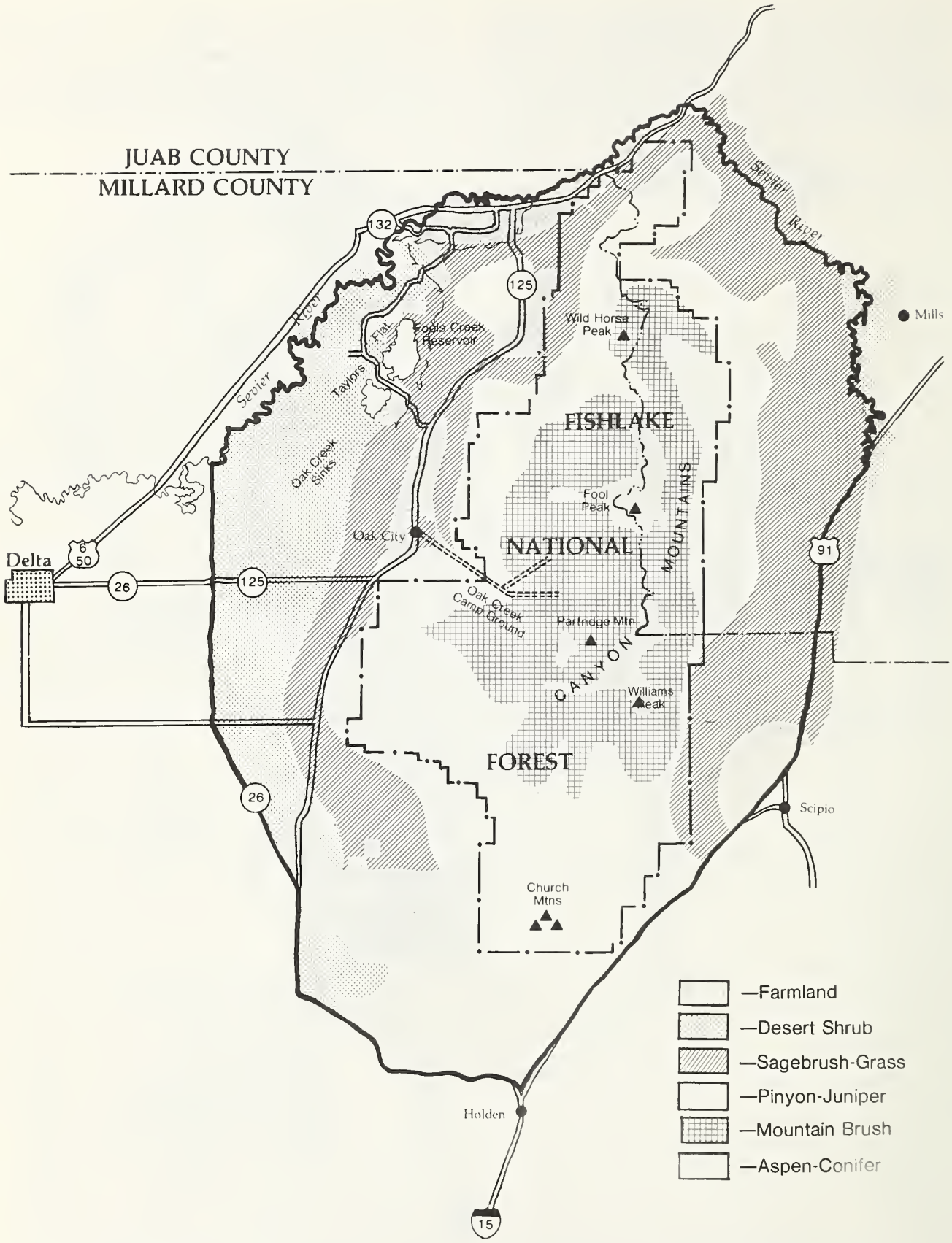

Figure 3—Vegetation zones.

HISTORY AND DESCRIPTION

Initially in 1973, the accelerated range management program as envisioned by the Forest Service was extremely ambitious. Several validation areas, often including various sites, were to be included. Baseline data and a variety of research projects dealing with vegetation, watershed conditions, wildlife habitat, socio-economic conditions, and other variables were to be compiled and completed. Only two actual projects of significant size and scope were established in the West. The first, the Oregon Range and Related Resources Validation Area, was started in 1976. In 1978, the Oak Creek Area was nominated by the Fillmore Ranger District, Fishlake National Forest, for inclusion in the Intermountain Region's Range Validation Program. The same year boundaries were delineated, initial funding levels were obligated, and range improvement projects were started. Initially called the "Oak Creek Validation Area," it was renamed "Oak Creek Mountain Range Evaluation Area" and finally changed to "Oak Creek Coordinated Resource Management and Planning Area." The project was to be completed by 1985.

The Forest Service assumed the lead role in coordinating the overall project. A project leader was assigned by the Forest Service and stationed at the Fillmore Ranger District office. Cooperators included the Bureau of Land Management, the Soil Conservation Service (SCS), the Agricultural Stabilization and Conservation Service (ASCS), the State of Utah, county commissioners, and private landowners. This group was facilitated through an executive and a steering committee. Cost-share funds were provided to ranchers in the project area through the ASCS, with the SCS providing technical assistance to private landowners.

Three types of range improvements were planned: (1) revegetation, (2) water development, and (3) fencing. The revegetation was to be done primarily through chaining and aerial seeding of the pinyon-juniper vegetation zone. Water development consisted almost entirely of piping water from available sources to a series of troughs. The fencing consisted of moving, building, and rebuilding fences to allow for the use of better grazing management.

Through 1981, the project proceeded mostly as scheduled. Then, from June 25 to July 31, lightning storms, coupled with dry weather conditions and high winds, caused fires that burned over 63,000 acres on the evaluation area (see fig. 4). One of the results of this fire was greatly increased funding. A great deal of revegetation work was completed—most for purposes of fire rehabilitation—along with much water development and fencing work. On-the-ground implementation of the project was put 2 to 3 years ahead of schedule. Many of the proposed range improvement projects on Federal and State land were completed as fire rehabilitation measures before they would have been approved as coordinated resource management plans. Areas of pinyon-juniper that had been burned were chained and seeded as originally planned. One large area that burned was BLM-administered land called the "Dust Bowl," which was primarily rolling hills or flat land supporting sagebrush-grassland. This area was seeded using rangeland drills. Almost 1,200 acres had to be reseeded later after severe windstorms blew out most of the germinated seedlings.

The fires threatened the small community of Oak City and caused some property damage. Approximately $1.4 million was spent trying to control them. Even without the massive chaining, seeding, and water development project, the fires themselves would have had some positive effects on the range through controlling and "knocking back" large areas of pinyon-juniper vegetation.

A major impact of the fires, of particular significance for this study, was on the research phase of the evaluation project. Many potential studies, monitoring opportunities, and research possibilities were lost. Research was restricted to a much more limited basis than was stated in the project plan.

In 1982, funding and a work force available for the project were greatly reduced. In 1983, this and other range evaluation projects were eliminated from the Forest Service budget as part of general Federal budget reductions. The Intermountain Region continued to coordinate and support the project, but the research and evaluation portion of the project was greatly reduced and the project received its final title: "The Oak Creek Coordinated Resource Management and Planning Area."

In 1985, planned project work on Federal land was essentially completed. Completed water development and revegetation projects in relation to the Forest Service and BLM allotment boundaries are illustrated in figure 5. Approximately $1.75 million had been spent on range improvement practices on National Forest and BLM lands. Cost-share funds channeled through the ASCS for work on private lands will continue.

APPLICATION OF BENEFIT-COST ANALYSIS

Benefit-cost analysis attempts to compare all of the benefits and costs associated with a given investment. It recognizes that most resources are scarce and should be allocated to meet the objectives of an individual, group of individuals, or the public at large. Inherent in economic analysis is the understanding that there are trade-offs in resource allocation decisions. If costs of a project are greater than benefits that are to be gained, then it is a questionable endeavor. Also, if greater returns for the same expenditures can be obtained elsewhere, the funds should be spent there. The major problems associated with applied benefit-cost analysis (as also with other tools of economic analysis) are those related to the difficulty of adding and comparing various benefits and costs. The most common way of doing this is to assign monetary values to all costs and benefits.

The benefit-cost approach has been widely used in analyzing public investment in range management, but it has its critics. Benefit-cost studies have often not favored public investments in range improvements. Moody, formerly with the ASCS, writes about the inadequacy of the cost-benefit ratio as a measure of the public interest. He quotes an anonymous reviewer's criticizing of "benefit-cost apologists." The reviewer suggests that the results rely "on the analyst's good judgment...which might as well be left to the public decision-maker (legislative or executive) where it always has rested rather than go through the quasi-scientific (really the 'pseudo' or 'mythical' scientific) hocus-pocus of benefit-cost" (Moody 1974).

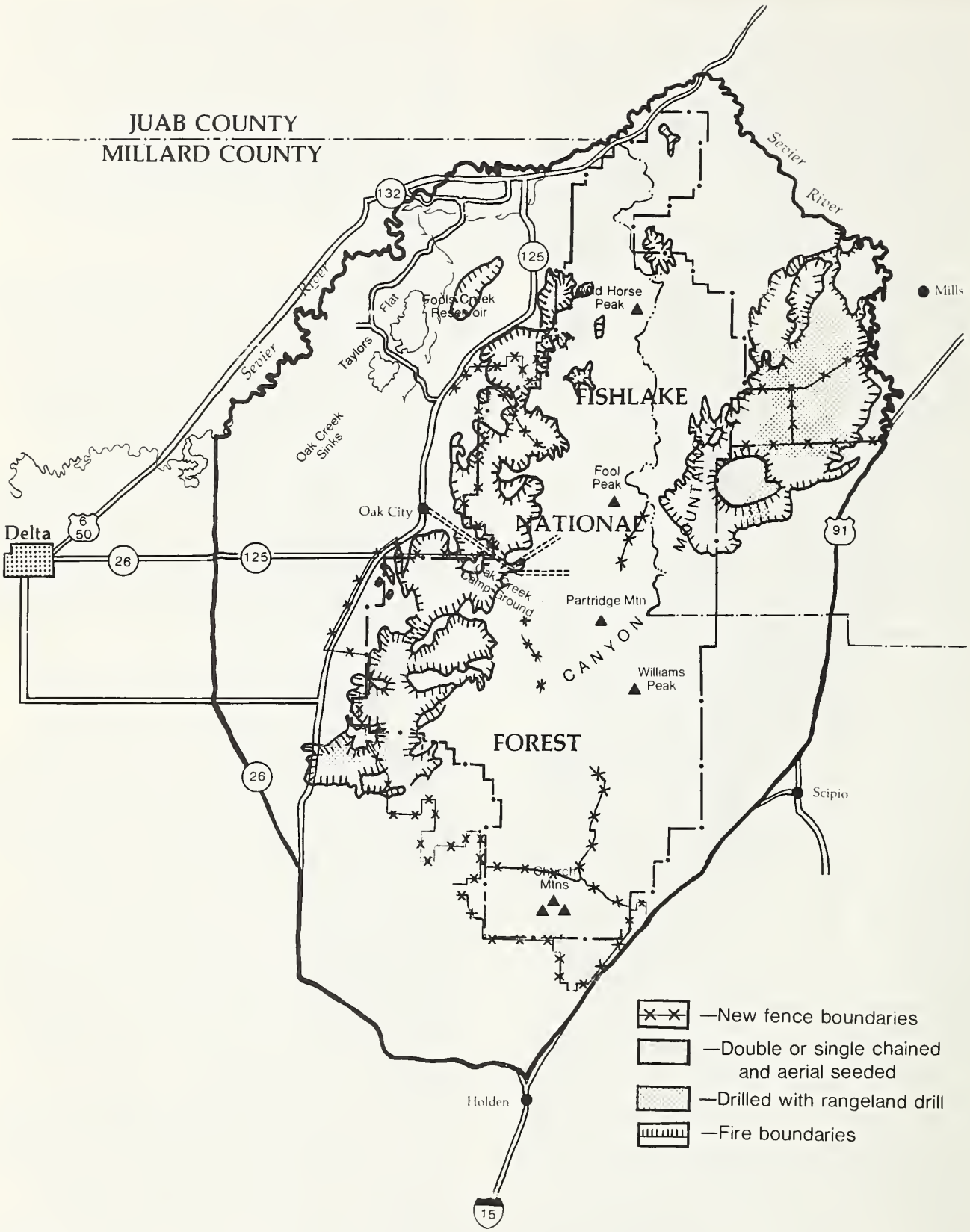

Figure 4—Fire boundaries.

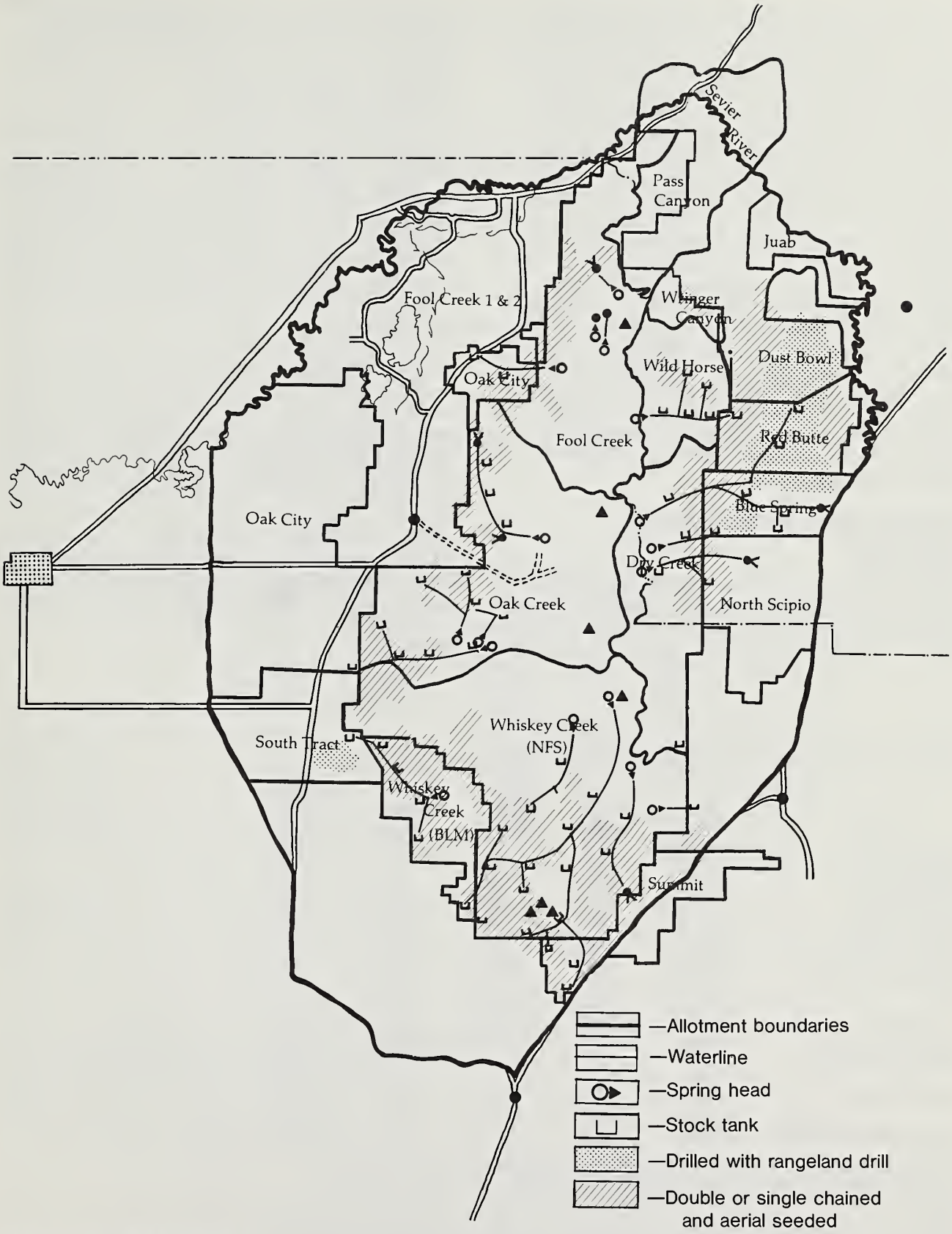

Figure 5—Improvement locations.

Of course, the question remains: Should public investment in range management be treated differently from private investment and should it become exempt from the rigors of economic analysis? Certainly public investment in range management can result in numerous nonmarket benefits that require good judgment to evaluate.

Although public investment in range projects is often motivated by noneconomic goals of government policy and various interest groups, this investment need not be exempt from economic analysis. Innumerable projects can be undertaken with the use of government funds—most of which would have the support of one interest group or another. The application of economic analysis, even with its inherent weaknesses, recognizes that resources, including public funds, are limited and should be allocated wisely. Benefit-cost analysis of a range-improvement project rarely, if ever, incorporates the value of all costs and benefits. But it can give a better understanding of how much we are paying for them. If measurable benefits do not outweigh measurable costs, it can then be asked whether unmeasurable benefits make up the difference or if the same public goals could have been accomplished through a less costly way.

RESULTS OF BENEFIT-COST ANALYSIS

Work completed on all seven Forest Service allotments in the area is included in the benefit-cost analysis. The two major areas of range improvement on BLM land are also included. In table 1, the numbers of acres, cattle, permittees, and AUM's for each of the areas are given. Table 2 reports the number of acres of revegetation, and the direct costs of revegetation work, water development, fencing, and fire rehabilitation. All of the data in tables 1 and 2 were compiled from information provided by Forest Service and BLM records.

Table 2 does not include overhead costs. Forest Service overhead costs of the project are estimated at over $287,000. The biggest item in these overhead costs was the project leader's salary. Other items include clerical help, use of pickup truck, other transportation costs, utilities, and building cleaning. All of these costs are prorated. Because of lack of reliable cost data, the overhead costs do not include any costs of buildings or building maintenance or any overhead cost for the BLM and other cooperators.

The calculation of monetary costs of the project is relatively straightforward; estimation of the value of the benefits is more difficult. Estimated net gains in AUM's resulting from the project are reported in table 3. These gains include not only increases in AUM's that resulted from the project, but also the mitigation or prevention of decreases that would have occurred had the project not been undertaken. For example, before the project there was to be a proposed average 35.5 percent reduction of AUM's on the Forest Service allotments. Following the project, AUM's available for livestock on National Forest land increased by approximately 22 percent. Both the avoided reductions and the actual increases in AUM's are included in the estimated net gains in AUM's from the project.

Table 1—Summary of areas of public land included in economic evaluation

Areas[1]	Total acres	Suitable acres[2]	Cattle before project	Permittees	AUM's[3] before project
Dry Creek (FS)	14,929	5,102	290	8	598
Fool Creek (FS)	23,273	6,054	158	5	532
Oak Creek (FS)	31,378	8,367	340	11	804
Pass Canyon (FS)	2,823	1,403	40	1	300
Whiskey Creek (FS)	36,925	25,987	481	12	2,243
Wild Horse (FS)	7,313	2,954	278	2	834
Wringer Canyon (FS)	2,946	1,142	91	2	182
Subtotal (FS)	119,587	51,009	1,678	40	5,493
Dust Bowl (BLM)	25,587	—	437	6	1,865
Whiskey Creek (BLM)	5,025	—	39	4	184
Subtotal (BLM)	30,612	—	476	10	2,049
Grand Total (FS and BLM)	150,199	51,009	2,154	50	7,542

[1]Each of the areas corresponds with allotment boundaries of the same name except Dust Bowl, which includes Blue Springs, Dust Bowl, Red Butte, and North Scipio allotments.

[2]Acres suitable for grazing of cattle. It is estimated that over 75 percent of the BLM land is suitable for grazing.

[3]Animal unit months (AUM) are, in practice, defined differently by the BLM and the Forest Service. The BLM defines an AUM as the forage required to sustain one mature cow with or without a calf for one full month and uses this measure (AUM) for purposes of billing for grazing fees. The Forest Service defines an animal month (AM) the same as the BLM defines an AUM and for the purposes of billing for grazing fees uses animal months. If the cow has a calf, the Forest Service adjusts AM by a conversion factor of 1.32 to get AUM's. For the purposes of this report, the BLM's definition of an AUM is used.

Table 2—Acres of revegetation and dollars spent on Oak Creek Management Project

Areas[1]	Acres of revegetation	Dollars spent				
		Revegetation	Water development	Fencing	Fire rehabilitation	Total[2]
Dry Creek (FS)	2,100	63,925	32,462	32,740	15,353	144,480
Fool Creek (FS)	1,750	59,184	26,448	24,892	2,890	113,414
Oak Creek (FS)	4,260	104,729	66,795	66,211	32,291	270,026
Pass Canyon (FS)	0	0	0	3,700	0	3,700
Whiskey Creek (FS)	8,025	251,171	111,021	78,662	0	440,854
Wild Horse (FS)	495	11,995	14,550	8,000	0	34,545
Wringer Canyon (FS)	175	4,241	0	0	0	4,241
Subtotal (FS)	16,805	495,245	251,276	214,205	50,534	1,011,260
Dust Bowl (BLM)	11,041	194,912	31,992	56,330	—	283,234
Whiskey Creek (BLM)	5,476	141,677	13,119	14,765	—	169,561
Subtotal (BLM)	16,517	336,589	45,111	71,095	—	452,795
Grand Total (FS and BLM)	33,322	831,834	296,387	285,300	50,534	1,464,055

[1]Each of the areas correspond with allotment boundaries of the same name except Dust Bowl, which includes Blue Springs, Dust Bowl, Red Butte, and North Scipio allotments.
[2]Excluding all administrative and overhead costs.

Table 3—Estimated net gains in AUM's, estimated value of AUM's, and benefit-cost (B/C) ratio for Oak Creek Management Project

Areas[1]	Estimated net gain in AUM's from project[2]	Capitalized value of added grazing fee revenue[3]	Capitalized value of AUM's added by project	B/C[4] ratio I	B/C[5] ratio II
Dry Creek (FS)	287	5,166	24,395	0.04	0.17
Fool Creek (FS)	372	6,696	31,620	.06	.28
Oak Creek (FS)	949	17,082	80,665	.06	.30
Pass Canyon (FS)	0	0	0	0	0
Whiskey Creek (FS)	1,480	26,640	125,800	.06	.29
Wild Horse (FS)	63	1,134	5,355	.03	.16
Wringer Canyon (FS)	0	0	0	0	0
Subtotal (FS)	3,152	56,736	267,920	.06	.26
Dust Bowl (BLM)	1,994	35,892	169,490	.13	.60
Whiskey Creek (BLM)	340	6,120	28,900	.04	.17
Subtotal (BLM)	2,334	42,012	198,390	.09	.44
Grand Total (FS and BLM)	5,486	98,748	466,310	.07	.32

[1]Each of the areas correspond with allotment boundaries of the same name except Dust Bowl, which includes Blue Springs, Dust Bowl, Red Butte, and North Scipio allotments.
[2]Including projected losses to occur without project.
[3]1.35/0.075 × (estimated net gain in AUM's from project). Note that these values are capitalized and not annual values.
[4](Value of added grazing fee income)/(total dollars spent).
[5](Value of AUM's added by project)/(total dollars spent).

Three sets of price data are used to estimate the value of an AUM within the project area. The first set of prices is accepted bid prices for grazing on State of Utah Division of Wildlife Resources land. The State lands, similar to those in the project area, that are included in an open bidding process are used to calculate average bid prices for each year. Most of this land is in pinyon-juniper ecosystems. Table 4 presents these data. Note that average accepted bid prices reported in table 4 are nearly equal to the appraised market value of grazing on public rangelands on price areas 4 and 5 as reported in the "1985 Grazing Fee Review and Evaluation" (U.S. Department of Agriculture 1985).

The second set of prices is from information on transfers of grazing permits from the Fillmore Ranger District. The Forest Service does not actually allow for direct transfers of permits between ranchers. The Forest Service has always maintained the right to make adjustments or even cancel permits to properly manage the range or forest land for a number of uses, only one of which is livestock grazing. When a rancher sells livestock or base property, the rancher waives the grazing permit back to the Government who in turn may reissue to the purchaser. By long-standing precedent, however, this permit is usually reissued to the purchaser of the livestock, base property, or both. Any value that the permit may have is incorporated into the sales price of the livestock, base property, or both. The permit values are recognized by ranchers and, in practice, can be and are bought and sold.

All transfers of reissuances of grazing permits from the Fillmore Ranger District that occurred from 1978 to June 1985 were obtained. These were transfers of permits on National Forest land within or directly surrounding the project area. In this period, 38 transfers occurred. During July 1985, buyers of these permits were contacted to establish the actual amount paid for the permits alone. Of the 38 transfers, 24 were bonafide transactions where the permits were actually bought and sold and the cost of the permits could be verified. All 24 transactions involved only the buying and selling of permits and cattle. On nine of the transfers, the cost of the permits could not be verified because the whole ranch was sold with no reliable breakdown of cost of permits, the buyer couldn't remember or didn't know the breakdown between cows and permits, or the transaction occurred between family members at a "less than arm's length" deal. Five of the buyers could not be contacted. All of the ranchers contacted willingly verified the transaction and provided the cost of the permits when it was available.

The cost of permits on an AUM basis ranged from $29.70 to $95.45 with an average of $57.29. The average costs of the permits on an AUM basis for 1978 to 1985 are given in table 5. They compare closely with 1983 public permit values in Utah as observed in the "1985 Grazing Fee Review and Evaluation" (U.S. Department of Agriculture 1985). That report showed average permit value per AUM ranging from a low of $42 to a high of $100 with an average of $50.

Table 4—Average accepted bid prices per AUM for livestock grazing on Utah Division of Wildlife Resources land, 1978 to 1985

Year	Number of areas	AUM's	Total dollars	Average annual bid ($/AUM)
1978	20	3,846.5	20,312.72	5.28
1979	25	4,367.5	20,727.73	4.75
1980	20	3,902	16,657.67	4.27
1981	18	3,129	17,005.95	5.44
1982	23	3,864	24,066.65	6.23
1983	20	3,841	21,942.93	5.71
1984	19	4,015	26,373.20	6.57
1985	28	4,543	29,121.88	6.41
Average	—	3,938.5	22,026.09	5.59

Source: Utah Division of Wildlife Resources (1978-1985).

Table 5—Average price of grazing permits in the Fishlake National Forest, Fillmore Ranger District, 1978 to 1985

Year	Number of observations	Number of AUM's	Average permit price ($/AUM)
1978	3	1,339.5	42.93
1979	3	469.68	63.61
1980	2	335.33	51.14
1981	2	216.83	72.06
1982	4	709.33	66.19
1983	4	732.83	69.73
1984	4	211.02	57.34
1985	2	76.33	53.45
Total	24	4,090.85	57.29

The final set of forage values used is the established grazing fee of the BLM and Forest Service. The fees charged from 1978 to 1985 are reported in table 6. When these fees are subtracted from the market value of an AUM as estimated by average accepted bid prices, the value of an AUM not captured by grazing fees is estimated. When this value is capitalized it approximates the value of a grazing permit. To get an indication of what would be a reasonable capitalization rate, table 6 reports the capitalization rates that would result in the average price of all grazing permits for each year.

Based on the available information, various values of an AUM can be estimated, depending on the assumptions used. (This is discussed further in Wagstaff and Pope, in preparation.) For example, if we assume that effects of the project extend into perpetuity (their effects are estimated more likely to last a maximum of 50 years), the average accepted bid price for similar grazing on State land can be capitalized. If the average 1985 accepted bid price of $6.41 is capitalized by 10, 7.5, and 4 percent, it yields capitalized values of an AUM equal to $64, $85, and $160, respectively. Another estimate of the value of an AUM can be obtained by taking the average AUM price of a grazing permit and adding to that the capitalized value

Table 6—Grazing fee per AUM for Forest Service and BLM and capitalization rate, 1978 to 1985

Year	Grazing fee		Capitalization rate[1]
	FS	BLM	
	- - - - - Dollars - - - - -		Percent
1978	1.60	1.51	8.68
1979	1.93	1.89	4.46
1980	2.41	2.36	3.69
1981	2.31		4.34
1982	1.86		6.60
1983	1.40		6.18
1984	1.37		8.89
1985	1.35		9.47
Average	1.77		6.67

[1]This value is obtained by subtracting the grazing fee value in this table from the average accepted bid price in table 4 and dividing the results by the average price of grazing permits from table 5.

of the grazing fee. The average AUM price of a grazing permit from 1978 to 1985 equals $57. The average grazing fee during this same period equals $1.77. Capitalizing $1.77 by 10, 7.5, and 4 percent and adding those values to $57 yields estimates of AUM values of $75, $81, and $101, respectively. Using available data and a variety of reasonable assumptions yields estimates of AUM values ranging from $50 to $160.

For the purposes of this analysis, an estimate of $85 is used as the capitalized value of an AUM. Multiplying it by the net gain in AUM's gives the value of project benefits to livestock production as reported in table 3. The benefit-cost ratios are also reported in table 3. Because the direct costs of the project greatly exceeded the benefits, the benefit-cost ratio overall for the project was only 0.32. When a conservative estimate of overhead costs is also included, the ratio drops to 0.27, indicating that the total costs of the project were nearly four times the estimated benefits to livestock production.

These basic results are not sensitive to reasonable changes in assumptions or methodology. Fine-tuning the assumptions or methodology or both tends to be even less favorable, in terms of economic feasibility, to the project. For example, if all costs and benefits are adjusted for inflation and a finite life of the project is used, then measured benefits are reduced and costs are increased. Most of the benefits of the project were not experienced until 1984 to 1985 or beyond. Many of the costs, however, were incurred up to 7 years before. Adjusting all costs into 1984 dollars using the gross national product (GNP) implicit price deflator results in real costs in 1984 dollars being approximately 15 percent higher than nominal dollars used in this study.

Also, as table 7 shows, well above-normal moisture conditions were experienced in the project area each year between 1980 and 1985. On the average, precipitation in the areas exceeded normals by nearly 50 percent. Although it is nearly impossible to separate the effects, given available data, it is likely that these several back-to-back years of relatively good moisture conditions would have improved forage production even without the project.

Table 7—Annual precipitation for Oak City, Scipio, and Fillmore, UT, Stations[1]

Year	Oak City	Scipio	Fillmore	Average
1970	12.11	12.99	14.04	13.05
1971	15.10*	13.39	16.00	14.83
1972	11.82	15.19*	15.95	14.32
1973	12.67	14.33	17.66*	14.89
1974	7.74	10.26	12.32	10.11
1975	15.58*	16.68**	14.95	15.74*
1976	8.25	8.64	8.66	8.52
1977	8.73	7.94	10.00	8.89
1978	19.16***	16.29**	16.79*	17.41**
1979	11.36	11.47	13.85	12.23
1980	17.99***	19.12***	17.77*	18.29**
1981	16.79**	15.87**	18.57*	17.08**
1982	18.26***	20.01***	21.27***	19.85***
1983	20.23***	26.03***	25.33***	23.86***
1984	19.37***	18.22***	20.55**	19.38***
1985	[2]13.68	[2]13.71	[2]17.34	[2]14.91
Normal	12.15	12.51	14.51	13.06

Source: National Oceanic and Atmospheric Administration.

[1]* indicates that the precipitation value is more than 15 percent above normal; ** indicates more than 30 percent above normal; and *** indicates more than 45 percent above normal.

[2]December precipitation values for 1985 were not yet available. Precipitation values for 1985 include only the first 11 months but are still above annual normals. If normal December precipitation is assumed, the average total precipitation for these three stations would be over 20 percent above normal.

Finally, the estimate of $85 for the value of an AUM on the project area may be a little generous. It is liberally based on data that have both the annual and capitalized value of an AUM, for the most part, slightly higher than even the "1985 Grazing Fee Review and Evaluation" (U.S. Department of Agriculture 1985). This report has been criticized mostly by ranchers and ranching organizations as having exaggerated AUM values. They suggest that the current grazing fee more closely reflects the actual value of an AUM on Forest Service and BLM range. This, of course, would imply that the capitalized value of an AUM is less than $20 and would further reduce the measured benefits of this project. Nevertheless, the general results of the analysis are not sensitive to reasonable estimates of AUM values. If overhead costs are included, the average value of an AUM would have to be over $300—three and a half times the value used in this analysis—to make the project economically feasible on the basis of increased livestock production alone.

For the most part, the results of this case study show that the incremental benefits of either revegetation or water development projects did not cover their respective incremental costs. One exception is on the BLM's Dust Bowl area. It is unlikely that the chaining and seeding of the pinyon-juniper was economically feasible on this area, even though much of the area is relatively level, is within the sagebrush-grass vegetative zone, and did not require chaining. After the fire swept the area in 1981, it was seeded using a rangeland drill. Because of severe wind erosion that took place in the spring of 1982, nearly 1,200

acres had to be redrilled. Forage available for livestock has increased dramatically. On the range that did not require chaining, and could be drilled with a rangeland drill, the benefits to livestock production nearly outweigh the costs.

NONMARKET BENEFITS

From a range management project of this scale should come important intangible benefits. For example, the project may have had significant impacts on wildlife in the area. Table 8 shows that the annual value of wildlife for hunting and fishing on the Oak Creek deer unit (a unit that closely corresponds to the Oak Creek Management Area) equals an estimated $242,848. This is much larger than the annual value of forage for livestock production on public land in the area. Before the project there were only about 7,542 AUM's on public land. The value of this forage is liberally estimated to equal $48,080 on an annual basis.

Given the nature of the area, wildlife biologists doubt that any significant increases in wildlife values resulted from the project. With respect to big game—almost exclusively mule deer—summer range is the limiting factor. The project did little or nothing to improve summer range conditions for mule deer. The chaining and seeding work did improve winter range for mule deer, but the increase in livestock numbers, and the greater dispersion of livestock made possible through water development, probably offset any potential for significant benefits to mule deer (personal communication with Marion B. Cherry, wildlife biologist, Fillmore Ranger District, Fishlake National Forest, and Verdon Durfey, game biologist for Southern Region of the Utah Division of Wildlife Resources). Others close to the project suggest that big game may respond positively to the project over a long period (personal communication with Ronald S. Wilson, District Ranger, Fillmore District). Impacts of the project on small and upland game were mixed (Cherry 1982).

Table 8—Annual value of wildlife for hunting purposes on the Oak Creek deer herd unit (#53), Fillmore Ranger District, Fishlake National Forest[1]

Factor	User days[2]	Average value per day[3]	Total value
Big game hunting[4]	6,646	$23.10	$153,523
Small and upland game hunting	3,000	26.80	80,400
Sport fishing	500	17.85	8,925
Total[5]	10,146	—	242,848

[1]These data are estimates obtained from an unpublished report, dated May 6, 1985, prepared by Marion B. Cherry, wildlife biologist, Fillmore Ranger District, Fishlake National Forest, and from personal communication with Cherry.

[2]User days are defined as 12-hour days.

[3]These values are substantially lower than those used by Idaho Fish and Game and the Washington Game Department.

[4]Hunters of big game with primitive weapons and on antlerless hunts are not included.

[5]Note that these are annual values and cannot be directly compared with the capitalized values in table 3. If the total value figure of $242,848 is capitalized by 7.5 percent as are the values for AUM's, the capitalized value of wildlife for hunting would be over $3 million.

The conclusions of the wildlife biologists are supported by deer harvest trend data in the Oak Creek deer unit (Utah Division of Wildlife Resources 1972-1985). In 1975, the unit was restricted to buck hunting only. The number of bucks harvested gradually rose from 218 in 1975 until it peaked at 693 in 1983. The percentage of successful hunters also rose from a low in 1975 of 13 percent to a high in 1982 of 48 percent. In 1984, the buck harvest fell to 514 and hunter success dropped to 29 percent. In an attempt to upgrade the deer herd, the Oak Creek deer herd unit was restricted to bucks with three points or better in 1985. The harvest dropped to 158 animals and the success rate was a mere 7.5 percent. Although several factors influence the deer herd in the project area, available information provides little evidence that the project made important contributions to wildlife values.

There are over 10,000 user days of outdoor recreation in the form of hunting and fishing (see table 8). No data are available on the number of days of dispersed nonconsumptive recreation. However, given the building of more fences, the tapping of natural springs for livestock water, and the increased grazing of cattle, it is doubtful that the impacts of the project on dispersed, consumptive, and nonconsumptive recreation are positive. Also, impacts on watershed values of the area were not measured, although reseeding in the Dust Bowl after the fire did reduce wind erosion.

One objective of the project was to enhance or stabilize the incomes of the ranchers involved. The project increased the number of AUM's available to specific ranchers. Because the annual value of those AUM's is greater than grazing fees, the project created a significant benefit to the specific ranchers involved. Current users of public grazing are concerned about any changes in grazing levels or fees. Changes in the level of allowable grazing or in the annual grazing fee affect the equity position of their ranches. To the extent that this project eliminated the need for reductions in grazing levels, the equity positions of the ranchers were maintained. To the extent that the project enhanced grazing levels, it enhanced their equity position.

It must be noted, however, that excluding cost-sharing funds channeled through the ASCS, approximately $1.75 million was spent. The present value of returns to the government from grazing fees is estimated at less than $100,000. The present value of benefits to the ranchers in terms of preserved and enhanced incomes and equity positions is less than $400,000.

CONCLUSIONS

In some ways the Oak Creek Range Management Project was a success. Forage available to livestock was increased, and the need for reductions in AUM's on some allotments was eliminated. To meet this end, project leaders and other participants demonstrated a high level of competence and cooperation. There was considerable value in having this project as a demonstration area for

range improvement and especially as a coordinated planning and development area. The value of the knowledge and experience gained from this project is not easily estimated. The project, however, based on comparison of costs and measurable benefits, simply was not economically justifiable. Although there is limited information about nonmarket costs and benefits associated with the project, the extent to which the costs exceeded even liberal estimates of benefits suggests that attempts to refine cost and benefit estimates would not change this conclusion.

It is also difficult to justify the project on the grounds that it met certain other public goals related to supporting local ranchers and communities. To do so implies there was not a more cost-effective means to meet these goals or that the goals were worth the differences between measurable costs and benefits. This project is questionable on both counts.

The public land within the Oak Creek Management Area is of particular interest because a superficial examination of the land suggests that it has little value except for its use in livestock production. The land is far removed from major metropolitan areas and is relatively desolate compared to other mountain ranges in the Intermountain West. Closer examination, however, indicates that the annual value of the area for outdoor recreation, primarily hunting, may be several times as large as the annual value of the forage for livestock production. Future management of such areas needs to take into account changing economic conditions that include relatively low beef prices, high costs of beef production on public lands, and an ever-growing demand for hunting, camping, wildlife and wildlands preservation, and other such uses of public land.

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APPENDIX: POPULAR AND SCIENTIFIC NAMES OF PLANTS, MAMMALS, AND BIRDS DISCUSSED IN THIS PUBLICATION

Plants

Common name	Scientific name
Alderleaf	*Cercocarpus montanus*
Antelope bitterbrush	*Purshia tridentata*
Big sagebrush	*Artemisia tridentata*
Bigtooth maple	*Acer grandidentatum*
Bluebells	*Mertensia* spp.
Cliffrose	*Cowania mexicana*
Common chokecherry	*Prunus virginiana*
Deerbrush	*Ceanothus velutinus*
Douglas-fir	*Pseudotsuga menziesii*
Engelmann spruce	*Picea engelmannii*
Fourwing saltbush	*Atriplex canescens*
Gambel oak	*Quercus gambelii*
Geranium	*Geranium richardsonii*
Greasewood	*Sarcobatus vermiculatus*
Horsebrush	*Tetradymia canescens*
Needle-and-thread	*Stipa comata*
Pinyon	*Pinus edulis*
Pinyon-juniper	*Pinus monophylla, Pinus edulis, Juniperus osteosperma, Juniperus scopulorum, Juniperus monosperma, Juniperus communis, Juniperus virginiana*

Plants

Common name	Scientific name
Quaking aspen	*Populus tremuloides*
Saltgrass	*Distichlis stricta*
Sand dropseed	*Sporobolus cryptandrus*
Sandberg bluegrass	*Poa sandbergii*
Serviceberry	*Amelanchier alnifolia*
Shadscale	*Atriplex confertifolia*
Slender wheatgrass	*Agropyron trachycaulum*
Smooth brome	*Bromus inermis*
Squirreltail	*Sitanion hystrix*
Subalpine fir	*Abies lasiocarpa*
Utah juniper	*Juniperus osteosperma*
Wheatgrass	*Agropyron cristatum, Agropyron intermedium, Agropyron smithii, Agropyron spicatum, Agropyron trachycaulum*
White fir	*Abies concolor*
Winterfat	*Eurotia lanata*

Birds

Common name	Scientific name
Blue grouse	*Dendragapus obscurus*
Chukar	*Alectoris graeca*
Mourning dove	*Zenaidura macroura*
Red-tailed hawk	*Buteo jamaicensis*

Mammals

Common name	Scientific name
Antelope jackrabbit	*Lepus alleni*
Blacktail jackrabbit	*Lepus californicus*
Bobcat	*Lynx rufus*
Coyote	*Canis latrans*
Mule deer	*Odocoileus hemionus*
Whitetail jackrabbit	*Lepus townsendii*

Pope, C. Arden, III; Wagstaff, Fred J. 1987. An economic evaluation of the Oak Creek Range Management Area, Utah. General Technical Report INT-224. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 14 p.

An economic analysis on the Oak Creek Range Improvement Project was conducted under the Intermountain Region's Range Validation Program of the Forest Service, U.S. Department of Agriculture. The analysis provided information about the overall effectiveness of range improvement practices within pinyon-juniper ecosystems. The revegetation, fencing, and water development resulted in benefits to local ranchers and communities, but these estimated benefits were exceeded by the costs of the project.

KEYWORDS: economic evaluation, range management, benefit-cost analysis, cost effectiveness

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